

Application No. 09/890,
Reply to Office Action of February 14, 2003.

REMARKS

Favorable reconsideration of this application as presently amended and in light of the following discussion is respectfully requested.

Claims 15-44 are pending in the present application with Claims 16, 26, 33 and 34 having been amended by the present amendment.

In the outstanding Office Action, Claims 31 and 42 were rejected under 35 U.S.C. § 112, first paragraph; Claims 15-20, 22, 24-26 and 28 were rejected under 35 U.S.C. § 103(a) as unpatentable over Weber et al in view of Chen et al; Claims 15-22, 24-27, 29-31, 33-40, 42 and 44 were rejected under 35 U.S.C. § 103(a) as unpatentable over Berman et al in view of Arimoto; Claims 21 and 27 were rejected under 35 U.S.C. § 103(a) as unpatentable over Weber et al in view of Chen et al and Nath et al; Claim 23 was rejected under 35 U.S.C. § 103(a) as unpatentable over Weber et al in view of Chen et al and Yamazaki; Claims 23 and 41 were rejected under 35 U.S.C. § 103(a) as unpatentable over Berman et al in view of Arimoto and Yamazaki; and Claims 28, 32 and 43 were rejected under 35 U.S.C. § 103(a) as unpatentable over Berman et al in view of Arimoto and Chen et al.

Applicants thank the Examiner for the courtesy of an interview extended to Applicants' representative on August 14, 2003. During the interview, the differences between the present invention and the applied art were discussed. No agreement was reached pending the Examiner's further review and a response is filed. Arguments presented during the interview are reiterated below.

Regarding the rejection of Claims 31 and 42 under 35 U.S.C. § 112, first paragraph, the outstanding Office Action indicates the limitation "wherein the antireflective layer comprises a layer of refractive oxide covered by a layer of nitride" raises new matter because the specification does not provide support for a layer comprising an oxide layer covered by a nitride layer. Applicants respectfully submit this feature is supported in the specification at

page 8, lines 2 and 3, in which the dielectric 2 (undoped ZnO) is covered with a silicon nitride layer. Accordingly, it is respectfully requested this rejection be withdrawn.

Claims 15-20, 22, 24-26 and 28 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Weber et al in view of Chen et al. This rejection is respectfully traversed.

Independent Claim 15 is directed to a thin-film solar cell including an absorber layer and at least one transparent window electrode disposed on a side on which light is incident. The window electrode includes at least a first metallic layer and at least one antireflective layer deposited on a side on which light is incident, situated opposite the absorber layer. Further, at least one first refractive dielectric oxide or nitride layer is between the absorber layer and the metallic layer of the window electrode. Independent Claims 24 and 33 include similar features.

As discussed in the previous amendment filed January 2, 2003, according to the present invention, a thin-film of metal such as silver, sandwiched between two refractive films of oxide and/or nitride, even made of dielectric materials is effective as a front (or top) electrode for a solar cell when combined with an absorber layer. The electrode can thus be manufactured at a low cost, with a significantly-reduced thickness as compared with electrodes including transparent conductive oxides.

It is noted the primary reference Weber et al disclose conductive oxide layers and not dielectric oxide layers as claimed by the present invention. In more detail, as noted in the present specification at page 2, last paragraph, if zinc oxide (ZnO) or another transparent oxide is used as material for the window electrode, this material, which is dielectric in itself, must be deposited as a doped semiconductor. The conductivity is achieved by doping, with aluminum or boron among other substances. As noted in dependent Claim 16 of the present invention, for example, the at least one first dielectric layer includes non-doped zinc oxide (i.e., a dielectric oxide). On the contrary, as noted in column 4, lines 1-5 of Weber et al, the

Application No. 09/890,
Reply to Office Action of February 14, 2003.

oxide layer 22 includes oxides ZnO, SnO₂ and ITO because of the ease with which they may be doped. That is, the oxide layers (such as the oxide layer 22 and 24) are doped to be conductive layers, and thus are not dielectric layers as claimed by the present invention. Chen et al also does not teach or suggest the claimed first refractive dielectric oxide and nitride layer between the absorber layer and the metallic layer of the window electrode.

Accordingly, it is respectfully submitted independent Claims 15, 24 and 33 and each of the claims depending therefrom patentably define over Weber et al in view of Chen et al.

Claims 15-22, 24-27, 29-31, 33-40, 42 and 44 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Berman et al in view of Arimoto. This rejection is respectfully traversed.

Similar arguments apply to this rejection as that discussed above. That is, Berman et al disclose conductive oxide layers and does not teach or suggest the claimed dielectric oxide or nitride layer between an absorber layer and a metallic layer of a window electrode. Arimoto also does not teach or suggest these features. Accordingly, it is respectfully requested this rejection also be withdrawn.

In addition, regarding the additional dependent claim rejections noted in the outstanding Office Action, it is respectfully submitted the additional references of Nath et al and Yamazaki also do not teach or suggest the claimed refractive dielectric oxide or nitride layer. Accordingly, it is respectfully requested these rejections also be withdrawn.

Application No. 09/890,8
Reply to Office Action of February 14, 2003.

Consequently, in light of the above discussion and in view of the present amendment, the present application is believed to be in condition for allowance and an early and favorable action to that effect is respectfully requested.

Respectfully submitted,

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